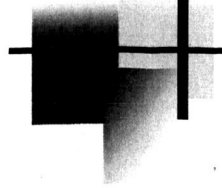




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True Cost of Amateur Cleanrooms



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Where do amateur cleanrooms come from?

- Scientists and Engineers
 - Need for a "clean" area to build experiments or handle sensitive parts.
 - A desire to manufacture items at reduced cost and at a preferred location.
- Project managers
 - Desire to save money.



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Where do they go wrong?

- Expanding it's goal from lab work to fulltime production.
- Not recognizing that humans are the source of contamination and cleanrooms have to be maintained.
- Not recognizing that part of the cost for a cleanroom is quantitative verification.

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Where do they go wrong?

- Cost to maintain a amateur cleanroom is the same as an engineered one.
- Cost to monitor the cleanroom is the same as well.
- Typically you can save a few thousand dollars a month – but will it be offset by delays in the process?



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Sources of loss in amateur cleanrooms

- Sometimes maintenance costs are higher because the location requires transport time for cleanroom crews.
- Usually materials of construction are inadequate and modifications eat into potential savings.
- Product quality can suffer.

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Typical problems

- Air flow rates.
 - HEPA filters installed but airflow not enough to keep positive pressure.
 - Pressure is ok but too few air changes to eliminate particles when workers are present.
 - Flows in room are not controlled to eliminate dead spots that collect particles.

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Typical problems

- Materials of construction.
 - Materials were used that produce particles or outgas unacceptably.
 - Materials contain contact contaminants i.e., phthalates or silicones.
 - Fit of materials allows movement that generates particles.

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Typical problems

- Ghost of past practices.
 - A good cleanroom is built clean.
 - Conversions can have particles crammed into every joint that act as an invisible source of contamination.
 - Some areas use building air that may contain organics (like shop oils and popcorn grease).



Examples

- This room was located inside of a highbay used for a machine shop.
- It was previously used a machine area and tool storage.
- The original HEPA plenum was made from particle board.

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Examples

- This room was located inside of a highbay used for a machine shop.
- It was previously used a quality control area and tool storage.
- The original HEPA plenum was made from particle board.

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Examples

- The plague of the flies.



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Examples

- The plague of the snake and mouse.



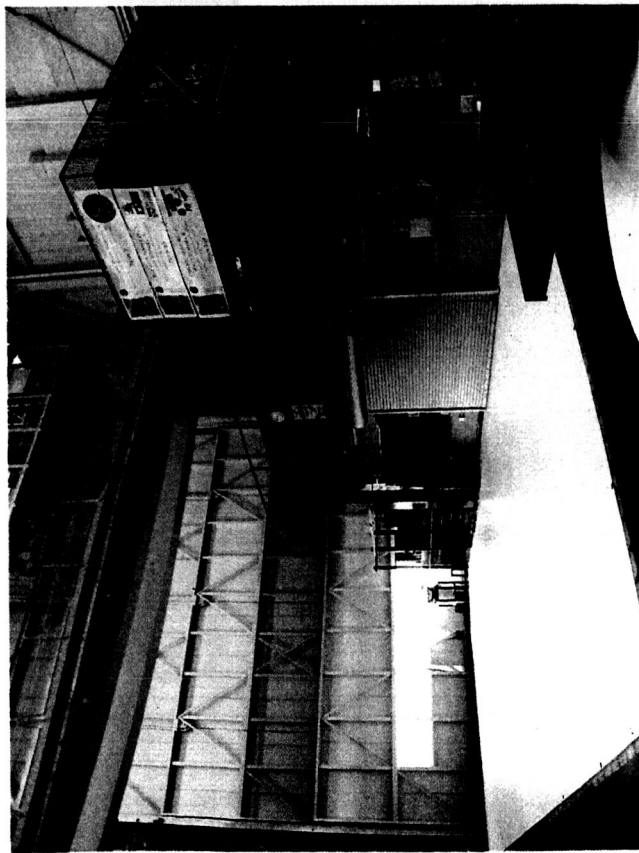
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Examples



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Examples

- The plague of the fire.



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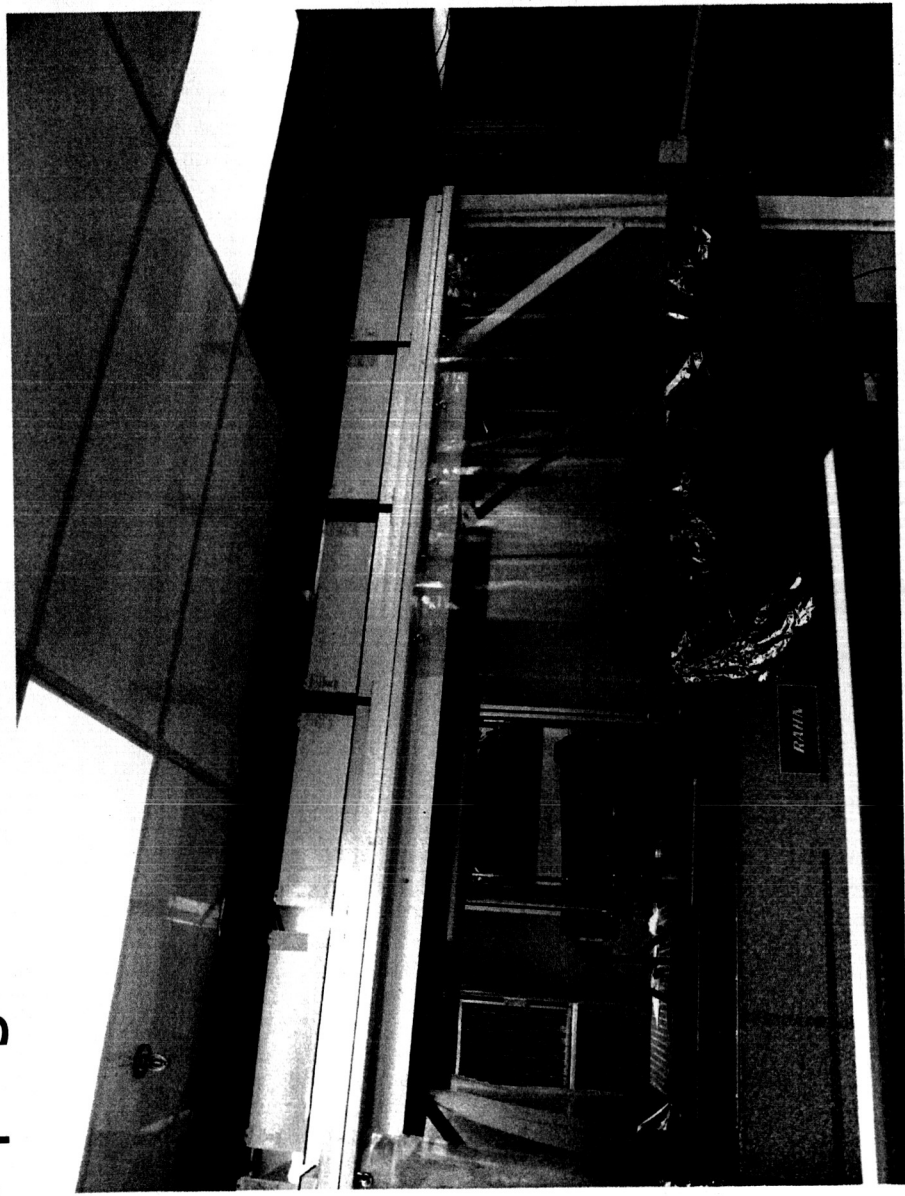


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Examples

- The plague of the flood.



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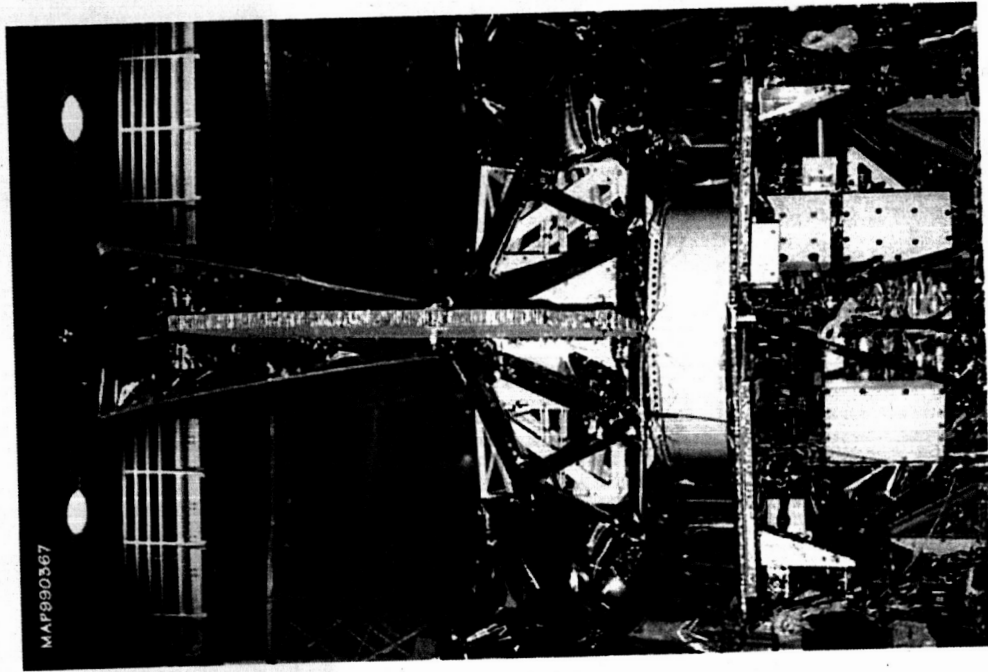


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Examples

- The static tent.



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